

CYSTS OF THE URACHUS (CONGENITAL
CYSTS, EXTRA-PERITONEAL CYSTS, OR
DILATATION OF FUNCTIONLESS
DUCTS).

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THE urachus of man is ordinarily a solid fibrous cord extending from the summit of the bladder to the umbilicus. It is the remains of a transitory, functional, foetal structure. It is the stalk of the allantois or that part of the allantois which remained inside the pleuro-peritoneal cavity after closure of the visceral folds which constitute the abdominal wall. The internal and external parts of the allantois become constricted and finally divided at the umbilicus. The urachus continues its existence in post-natal life as the suspensory ligament of the bladder. It is not unlike many other foetal structures or acquired abnormalities which exist, and occasionally become pathological, at the points where the opposite halves of the body coalesce. The allantois springs out of the pleuro-peritoneal cavity before the visceral plates coalesce. It grows wider and longer until the distal part of its sac blends with the most external foetal envelope—the chorion. The allantois conveys the blood vessels from the embryo to that part of the placenta which is in contact with the endometrium, where the foetal and maternal circulation establish their relations. In the chick it is easily seen and acts as a kind of lung to aerate the blood. In the early foetal calf I found the most typical allantois to study. Now, the distal part of the allantois or that part outside of the pleuro-peritoneal cavity soon fulfils its function and shrivels away as far as the umbilicus where the closing visceral plates have constricted it. The

proximal part of the allantois—the stalk—or that part inside the pleuro-peritoneal cavity, still persists. This persistent stalk of the allantois finally forms the urethra, bladder and the *urachus*. The *urachus* is an even calibred tube, reaching from the cloaca to the umbilicus during considerable foetal life. During very early foetal life the *urachus* is the receptacle for the excretion of the pronephros, or man's first kidney, whose excretion is carried to the *urachus* by the duct of Müller. Later the *urachus*, slightly changed, receives the excretion of the mesonephros, or man's second kidney, by way of the Wolfian duct. Finally, the *urachus*, considerably changed in shape, receives the excretion of the metanephros, or man's third kidney, by way of the ureter. The urethra and bladder are the only functional parts of the stalk of the allantois in post-natal life; the remaining functionless part is known as the *urachus*. It is the white, hard, fibrous cord seen stretching from the bladder to the navel, and lying between the two functionless, foetal hypogastric arteries. It, of course, must be remembered that the *urachus* lies outside the peritoneal cavity, as do all viscera.

From the extra-peritoneal character of the urachal cyst arises the first puzzle in the operation, as the surgeon cannot find the anterior parietal peritoneum; it is displaced backward.

Cysts of the *urachus* are congenital or acquired. Both varieties are occasioned by an unclosed duct. The acquired cyst may, so far as I have seen, arise at any period of life, up to 45 years of age, and I know no reason why it cannot occur at any age. It appears that the unclosed cavity in the *urachus* may remain dormant for years, and then take on pathological condition. Any part of the *urachus* may dilate, but the part next to the bladder seems the most liable, as that is the last portion to become functionless.

The frequency of cystic dilatations of the *urachus* is difficult to estimate. I examined some 40 sheep, but did not notice a trace of a dilated *urachus*. In examining the pelvic organs of 150 sows, I was wonderfully impressed how much the sow was subject to most kinds of cystic dilatations. Cystic ovaries were astonishingly common. Dilatation of the mesonephritic tubules and Gartner's duct were frequent. Dilated cysts of the broad

ligament were often seen, but these are likely dilated lymphatics. Cysts of the urachus in the sow are quite rare, but we can observe that the urachal cord is uneven in thickness, and no doubt from these little bulges occasionally arise the cysts. However, I did not see a cyst as large as a bean in 150 sows.

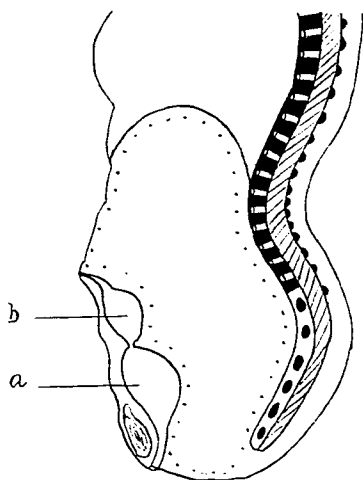


FIG. 1.—URACHAL CYST OF A 10 YEAR OLD BOY FROM POST-MORTEM.

a. Bladder.

b. Urachal cyst.

The dotted line represents the peritoneum.

But it was quite a different matter in the foetal pig, of which we examined about 30. In the very early foetus the bladder was elongated, and it was frequent to see cysts which one could easily record as urachal cysts, but no doubt they rapidly close in late foetal life. In examining some 60 cows I saw no urachal cysts, though the cow is quite subject to cystoma of the ovary and the functionless ducts of the broad ligament (especially Gartner's duct). In a big bull I noticed that the urachus toward the bladder was quite thick.

In experimental intestinal work on dogs, I carefully post-mortemed about 175, but did not see one case of dilated urachal cyst. I worked several years in dissecting rooms, paying special attention to visceral and pelvic anatomy, but did not see any urachal cyst in but one autopsy; which is represented in figure 1. Yet I saw much variation in the appear-

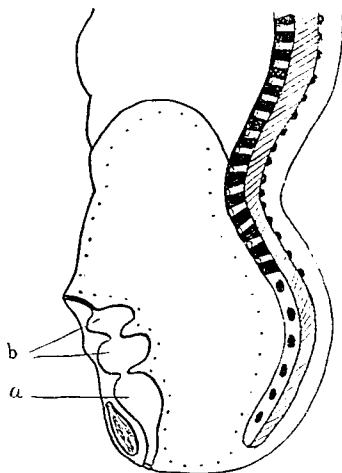


FIG. 2.—MULTIPLE URACHAL CYST.

a. Bladder.

b. Urachal cysts.

The dotted line represents the peritoneum.

ance of the urachal cord. Meckle and Hoffman each report urachal cysts in pigs. Meckel's case showed a cyst an inch in diameter, and Hoffman's looked like a double bladder. J. Bland Sutton has seen a urachal cyst in a mole. However, the best method to study urachal anomalies is to examine a large number of the embryos of the pig and cow in all stages of uterine life. Then it is instructive to examine these same kind of animals immediately after birth. So far, I have been

unable to examine the urachus of a horse. But both Gurlt and Freer give excellent examples of urachal cysts in this animal. I understand from veterinarians that the horse is one of the most typical animals to show urachal cysts, and that quite late in horse foetal life the urachus is found often quite a distance above the bladder.

The *perviousness* or patency of the urachus has been claimed and disputed for more than a hundred years, but it has received so slight systematic attention that we are not in position to categorically state its distinct life-history, either foetal or post-natal. No doubt it may remain patent during foetal and adult life. However, at present we are all aglow with views on visceral anatomy and medical colleges are wisely establishing chairs in this department which will result in much advancement. The searchers in visceral anatomy will, by the aid of comparative anatomy, solve the evolution of individual visceral organs. Many good observers have recorded urachal cysts in man. Mr. Treves, of London gives a case of a man, æt. 40, who had a urachal dilatation of an inch in diameter. The man had a stone in his bladder which was extracted by introducing the finger into the bladder by way of the urachus and drawing the stone out through the urachio-umbilical fistula. Mr. Jordan Lloyd, of Birmingham, England, personally related to me while on a visit to him, that on several occasions children have been brought to him with urine escaping at the umbilicus. In these cases Mr. Lloyd had demonstrated that they were urachio-umbilical fistulæ by passing a sound from the umbilicus by way of the urachus into the bladder. The escape of urine from the umbilicus and the connection of the tract with the bladder renders a patent urachus positive. Dr. Freer, of Washington, D. C., gives the case of a woman who came to him with a discharge of urine from the umbilicus. She had been affected for a long time with a chronic purulent discharge from the umbilicus which had greatly exhausted her. A sound passed into the fistula its whole length, and by moving the distal end of the sound, one could feel that the cavity had a diameter of some three inches. He washed out the urachal cyst. Its connection with the bladder was demonstrated in two ways. First, when the

woman strained urine passed out at the umbilicus. Second, a solution of starch was injected at the umbilicus and the urine drawn from the bladder, subsequently treated with iodine when the characteristic blue iodide of starch appeared. This woman had been cured many times but had experienced as many recurrences. Curiously enough she found no difficulty in making water *per vias naturales*. Frequently persons afflicted with urachal cysts experience difficulty in urinating at pleasure and when they attempt to urinate the urine regurgitates into the cysts. The difficulty in urinating with a urachal cyst is illustrated by a case collected by Dr. Freer. A middle aged woman could not urinate at pleasure for when she attempted to make water the muscles of the bladder contracted and drove the urine into the urachal cyst until it was full. She could then evacuate the urine by pressure of the hands on the belly. By the continuous pressure the urine was driven out of the cyst into the bladder, whence the bladder, having the escape of least resistance blocked, expelled it through the urethra. She became pregnant, and the enlarged uterus obliterated the urachal duct between the cyst and the bladder. This obstruction in the vesicular end of the urachus confined a considerable quantity of fluid. As the enlarging uterus encroached on the cyst it produced so much disturbance that it was decided to aspirate it. The gestation ended without further disturbance from the cyst. Four years subsequent another pregnancy again called for emptying of the cyst, which was followed by abortion. At this time the communication between cyst and bladder became obliterated with final cure.

The *Medical Record* of 1879 reports a case where a man had pain and soreness around the navel. The abdomen was explored and a phosphatic calculus as large as a walnut was removed from a patent urachus. Dr. Helmuth reports a case operated on which was fatal on the fifth day. The woman had been afflicted with a urachal cyst for forty-seven years. Dr. Helmuth operated on her for ovarian cystoma. On cutting through the abdominal wall he came on to the urachal cyst and incised it. He introduced his finger and found it communicated with the bladder. The urachal cyst was pushed aside and the ovarian cystoma behind it removed. Dr. Hel-

nuth stitched the urachal cyst-wall together as one would do the bladder walls in suprapubic lithotomy, but peritonitis ended the scene. Dr. Atlee reports a case of "urine cyst" and says it was "a purse in a dilated urachus." Dr. Thomas reports a case in the *Medical Record* of 1878, on which he operated successfully. Dr. Freer collected a case in which a student had a urachal cyst which finally killed him. Repeated tappings did not cure it. When he died the urachal cyst contained 100 pounds of fluid, while he himself only weighed 92 pounds. Dr. McLean, of Troy, reports a case of urachal cyst in connection with ovariectomy which proved fatal. The foregoing curt reports of cases show that the urachal cyst has been recognized by individual operators for twenty years. But it is the modern impulse given to biology and comparative anatomy that has so widely contributed to our knowledge of fetal structures and their subsequent history in post-natal life.

I wish now to report the newer ideas and results which have resulted from the cultivation of laparotomy. In the department of urachal cysts Mr. Lawson Tait has been the real epoch maker. What he has taught in the past eight years about these cysts has been a revelation to the abdominal surgeon. For a long time these cysts puzzled me and I knew of abdominal sections which were neither intelligible to myself nor to others present. I have seen surgeons opening the belly in a bewildering manner from pathological conditions and lack of finding the peritoneum and it was still more bewildering when the belly was opened. They did not recognize the real condition of a urachal cyst, but called it a peritoneal abscess, or encysted peritonitis. Up to 1886 Mr. Tait had reported 14 cases, and I know of 4 more cases which I had good opportunities to observe during my six months' course with him. Of course Mr. Tait is liable to get these rarer cases as he taps the clinics of the globe for his material. In 1886 Mr. Tait read a report of 12 cases of urachal cysts before the British Gynecological Society. To show that the subject of urachal cyst was really new five years ago when Mr. Tait read his paper, I will quote what Dr. Bantock said in the debate of the cases. Dr. Bantock said: "*The cases were of remarkable interest, but he feared there was not one who could discuss the subject from*

experience." Here is an operator, a prince among abdominal surgeons acknowledging his inability to discuss the subject only five years ago. He said, however, that Mr. Tait had called his attention to these cases by his paper and that he remembered having two cases which were likely of this same class. I will give one case in Dr. Bantock's own words as it is such an excellent picture of a typical case. "The first case was that of a married woman, *æt.* 30, and the mother of two children. On dividing the parietes I opened into a cyst containing 25 pints of thick grumous fluid with a very decided biliary tinge. When the whole of the fluid was removed the cyst was found to be unilocular, and looking down into the pelvis was like looking into one's hat, so completely did the walls of the cyst line the pelvic cavity. After separating what appeared cyst wall from the parietes on each side, and cutting away what was thus separated I recognized the hopelessness of proceeding further and I washed out the cyst with solution of iodine and closed the wound, leaving a drainage tube passing down to the bottom of the pouch. Although the separation of what was taken as cyst wall was carried beyond the umbilicus, the peritoneal cavity was not opened. A thick pultaceous fluid of the color of mustard came from the cavity for many weeks, and the patient was discharged quite well at the end of two months I lately saw this patient in perfect health. The source of the brilliant yellow color of the discharge is still a puzzle to me."

The second case of Dr. Bantock's is very typical and as he acknowledged he was at a loss to explain the relations of the cyst, as well as Dr. Amand Routh with whom he saw her, I will give the second case in his own words of debate. "The second case was that of a married woman *æt.* 37, the mother of 3 children. The history told was that she was taken ill on January 10, last, with violent sickness and pain all over the 'stomach.' She was laid up and became feverish, the pain lasted, severe, for five days and the sickness two days, the abdomen gradually got larger and about the end of February, she was tapped of rather more than a gallon of thickened pale-yellowish fluid. In about a month more, she was again tapped to the extent of three pints of a thicker fluid and recommended

to apply poultices. Shortly after this the puncture-hole opened and discharge came away. She then presented herself at the out-patient department of the Samaritan hospital under the care of Dr. Amand Routh, with whom I saw her. There was a fistulous opening, about two inches below the umbilicus in the middle line, and an ordinary surgical probe passed in for its whole length. She was admitted into the hospital on July 20, and I thought I had to deal with a multilocular tumor of which a central cyst had suppurated, as on withdrawing the probe no discharge followed. On July 27, I divided the parietes by a double elliptical incision with the view of cutting out the fistulous track and was not a little surprised to find on completing the division on one side that I had opened directly into a unilocular cyst containing from 3 to 4 pints of purulent looking fluid. On further examination I found the same condition of things as in the first case and recognizing the unadvisability of proceeding further I thoroughly washed out the cavity with plain warm water and closed the wound, leaving in a glass drainage tube. The patient presented herself to the hospital 2 or 3 weeks ago in perfect health. In this case the uterus was low down, pressed forwards and fixed. I was as much at a loss to explain the relations and origin of this cyst as in the first instance, but I thought they were worthy of being related in connection with the very remarkable cases read by the President" (who was then Mr. Tait). Here are two unrecognized urachal cysts. Both are unfinished operations at the time by the best of operators but both recovered. Both women had borne children and the cyst wall bulged and projected into the pelvis in each case. Both presented the puzzling character of the cyst being out side the peritoneum and the operator could not find the peritoneum. Also that the cyst wall could not be removed. I would call attention to the idea in these cases, that though the urachal cyst filled the pelvis the ovaries and tubes performed their functions and the women bore children. Hence all the peritoneum could not have been displaced out of the pelvis, as there must have been sufficient left to hold the tube and ovary in relation to get an egg from the ovary down the tube into the uterus. Also that part of the peritoneum which covers ovary (the germinal epithelium) must have been left

undisturbed as ovulation progressed. Right here I wish to speak of the relation of the peritoneum to the urachal cyst. I understand from Mr. Tait's writings and remarks at these operations during my visit with him, that he holds that the peritoneum does not go down into the pelvis in some of the cases. He claims that the peritoneum in some cases is entirely displaced from the pelvis or that it never was there. Observe that some of those cases to which this remark of Mr. Tait's applies were cases who have borne children. His expressed views are that the peritoneum leaves the anterior abdominal wall where it comes in contact with the urachal cyst. The peritoneum then passes backward and downward behind the swollen cyst as far as the promontory of the sacrum where it is reflected—not entering the pelvis. It seemed to me to be a necessity that the parous woman must have peritoneum in the pelvis to make the ovaries of any use and for that matter the tubes. The ovaries cannot make normal ova without germinal epithelium, and the germinal epithelium is a part of the peritoneum covering the ovary. It is also likely that the tube cannot transmit an egg to the uterus without normal relation of the peritoneum to the fimbriated end of the oviduct, for the ovum is really first shed into the peritoneal cavity before it even gets into the mouth of the tube. When I called Mr. Tait's attention to the view that a woman could not likely have children without peritoneum holding some relation to the ovary and fimbriated end of the oviduct, he replied that the urachal cyst wall acted as peritoneum to tubes and ovaries. To this I could not agree. For, any part of the peritoneum is not convertible into germinal epithelium which especially covers the ovary. Much less could a urachal cyst wall be converted into germinal epithelium, and cover the ovary so as to perform the new function of ovulation. The peritoneum surrounding the ovary is selective and it alone is endowed with elective power for ovulation. The germinal epithelium of the ovary cannot transfer its authority to some other portion of the peritoneum, much less to any cyst wall of a dilated functionless duct. The conclusion is therefore in the reproductive woman that the dilated urachal cyst no matter how large is *superimposed* on the peritoneum covering the ovary and on

sufficient surrounding the fimbriated end of the oviduct to allow the transmission of an egg to the uterus. This statement may seem strange when a vast urachal cyst will reach from pelvis to stomach but a little observation of the peritoneum will soon convince any mind that the peritoneum is endowed with an enormous capacity for stretching, particularly if that stretching be done very gradually. Beside slow gradual pressure will dissect off large tracts of peritoneum, thus giving it more opportunity to stretch.

However, it must be admitted that we have, so far, no conclusive, scientific *post-mortem* of cases in which the urachal cyst completely fills the whole pelvis and until such autopsy is produced with frozen section, we must wait for light. Hence I will drop the further discussion now.

Mr. Tait divides his cases of urachal cysts into two distinct groups. In the first part the cyst walls were tougher and could be separated from the other viscera. *The cyst wall did not dip into the pelvis.* They thus only partially displaced the pelvic peritoneum. They would only gradually dissect or strip off some peritoneum, according to the size of the urachal dilatation.

In the second group of cases the cyst wall *always dipped down into the pelvis.* The wall of the cyst was brittle, friable and gelatinous. Mr. Tait in this class of cases claims that there is no other kind of peritoneum in the pelvis than the urachal cyst, and that its walls act as a peritoneum. A peculiar flaky, shreddy substance like lymph shreds appeared in the cysts. In the second group of cases the relation of the lower peritoneum and the upper cyst wall was entirely different from the first group. The second group did not permit the extirpation of the cyst wall.

I wish to state that this article was finished up to this point some time ago and laid aside, but later I had a personal conversation with Mr. Tait on this subject in which I found I had misinterpreted his previous remarks and writings relative to the *peritoneum*. It might, at first glance, appear that the above two groups were simply examples of degrees of development of the urachal dilatations. I had taken this view of it, but Mr. Tait favors the view that the lower zone of the peritoneum

being developed out of the allantois, originally, has never contracted into the small urachal stalk. Hence it is therefore just the same as the original peritoneum which comes from the allantois. The pleuro-peritoneal cavity in the cases where the cyst goes down and fills the pelvis, will have two diaphragms—the natural one and one at the umbilicus. Or rather there is constriction between the upper and lower peritoneal cavities. In such cases a new partition is added which supports the intestines. According to him, then, the lower zone of the pleuro-peritoneal cavity is simply constricted in early foetal life. This view of Mr. Tait is reconcilable with reproduction as there would be germinal epithelium on the ovary and ordinary relations of the peritoneum to the tube to transmit an egg to the uterus. However, I must say that this cyst wall does not look much like peritoneum to me, even after making due allowance for pathological changes. In the cases I saw it was thick as sole leather, friable, brittle, gelatinous and reflected light when it was tore or cut, just as jelly would. I could easily stick my finger through its cheezy, rotten walls, which would tear off in little bits if one attempted to enucleate some of the cyst from its bed.

Mr. Christopher Martin, Mr. Tait's assistant and myself did some microscopical work on the Fallopian tubes of one of the cases in which the urachal cyst wall completely filled the pelvic cavity. The wall of the cyst wrapped itself around the Fallopian tube just like a meso-salpinx. The woman had borne children. On cutting the oviduct square across with a sharp knife the naked eye could easily distinguish the urachal cyst from the tubal wall. There was a distinct line of demarcation between the friable, gelatinous urachal cyst wall and the muscular tube. The wall of the Fallopian tube was thickened. Its mucous membrane looked ragged and disorganized. Under the microscope, in the cyst wall, one could see a mesh work of fibrous connective tissue; considerable non-striated muscular fibres appeared. Some tubercles with giant cells were visible; also some fat. Sparsely scattered through the cyst wall was some substance which appeared to me like calcareous deposit. On the interior of the urachal cyst wall I could not make out the epithelium with sufficient distinctness

to describe it. The walls also showed an extra number of large blood vessels well filled. I rather thought we would find the peritoneum between the exterior of the urachal cyst wall and the Fallopian tube. But I could find nothing definite. The cyst wall and the tubal wall had so intimately blended that all I could see definitely was a line of connective tissue. Now, by stripping off the urachal cyst wall from the tubal wall in many places a shiny surface could be plainly seen with the naked eye. This appeared to me to be the peritoneum. At least, in

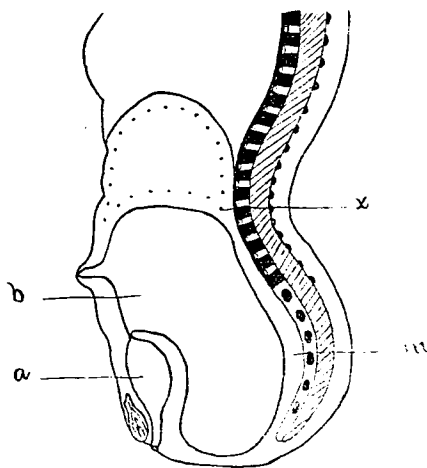


FIG. 3.—A URACHAL CYST WHICH DIPS INTO THE PELVIS.

a. Bladder.

b. Cyst which extends from the floor of the pelvis up to X, the end diaphragm. The unsettled point is the relation or existence of the peritoneum between x and m. X shows the diaphragm on which the intestine rest.

The dotted line is to represent the peritoneum.

any other place, under ordinary conditions, I should call it peritoneum. The cyst wall would not strip from the tube in all places alike, but in patches. It had local adhesions.

Again, after carefully examining the ovary, the best I could

make of it was that the cyst wall partially went over it. The main part of the ovary seemed to be covered by its natural peritoneum, while the urachal cyst could be found on part of it. A Graafian follicle had just ruptured, and at the bottom of its cavity was plainly visible the corpus luteum but yet slightly convoluted. Hence, it is my opinion in this case that the urachal cyst wall is *superimposed* on the peritoneum covering the tube and ovary. This conclusion is made with due deference to Mr. Tait's views, as I consider his opinion on this subject the most weighty, as he has really put the whole subject on a recognized surgical basis, and also for the reason that I gained a large part of my knowledge of those urachal cysts which *fill the pelvis* from the opportunities of seeing and assisting in operating on four of his typical cases. Future work will probably be more decisive.

Following will occur a short description of some cases. As the paper is a little long, I condensed them.

The first I will describe is a girl, æt. 17. on whom Mr. Tait operated. I saw the case before the operation with Dr Christopher Martin and we carefully examined it. She began to menstruate at 13, and was fairly regular for awhile, but for the past 18 months she was irregular and felt very poorly. The lower abdomen was hard and brawny. One could only define a limited fluid in the abdomen. The belly over the cyst wall felt hard and elastic. A peculiar but distinct wave of fluctuation could be made out. The whole pelvis and lower abdomen was absolutely dull on percussion. The wave extended up to 2 inches above the umbilicus, but above that the abdomen was distinctly tympanitic. The wave showed that there was only one cyst, and that was symmetrical. It was a typical case and showed peculiar differences from ovarian or par-ovarian cystoma. Dr. Martin suspected a urachal cyst. Mr. Tait examined her shortly after and said he thought it was a urachal cyst.

In operating on the case, Mr. Tait cut down as usual, but I at once observed that he came on to no peritoneum. Instead of the peritoneum; there appeared a dark red tissue, having an inflammatory outlook. It might easily be mistaken for very much thickened peritoneum, though when once familiar with this kind of cyst, it is immediately recognized. He gradually cut through the cyst wall, which was as thick as sole leather. It was very brittle and gelatinous. Its broken edges

reflected light. It could not be separated from its bed. Out of the cyst flowed a peculiar thick pultaceous substance. Flaky, flocculent lymph shreds and jelly-like masses were its main contents. After thoroughly irrigating the cyst, Mr. Tait asked me to examine its interior. So, I introduced my hand and found that all the intestines (except the descending colon) lay above the level of the umbilicus and above the upper wall of the cyst. The cyst itself was a great open cavity. Its walls did not collapse, but lined the abdominal and pelvic walls. Looking into the cyst was like looking into a blown-up sac, or into the crown of a felt hat. I felt the uterus fixed and confined against the pubes, and the tubes as large as my thumb, stretching like guy ropes outward to the pelvic wall. The cyst wall was wrapped around the tubes like a meso-salpinx, and covered with tubercles. The muscular wall of the tubes was well intact, for after Mr. Tait had removed them, they continued their rhythmic peristaltic movements some time, which I kept up by exposure to the air and pinching the tubal wall. The cavity of this open, patent cyst extended from just above the umbilicus to the floor of the pelvis. Its rigid, upper wall acted as a diaphragm and prevented the intestines from filling the cavity. Herein lies the danger that this patent cyst will exhaust to death by continued suppuration. If the case recovers, no doubt the viscera will crowd down and collapse the cyst wall, and fill up the empty cyst which occupies the lower abdomen and pelvis.

Now, the view that Mr. Tait favors in this kind of case, relative to the peritoneum, is that it reflects itself from the anterior abdominal wall, just above the umbilicus, or at the upper border of the urachal cyst. It then passes backward behind the cyst, and downward to the crest of the ilium, and is reflected back on the sacrum, and does not enter the pelvis at all. The great open urachal cavity is an arrest of early foetal development, and acts as peritoneum for pelvic viscera—*ovaries*, tubes and uterus. He means that the lower zone of the pleuro-peritoneal cavity met with an accident in growing, and the large allantoic cyst never contracted into the ordinary urachus. An accidental constriction occurred at the umbilicus and the lower border of the peritoneum and the upper border of the urachal cyst blended into a diaphragm. Another view may be offered that the cyst is the ordinary dilatation of the urachus, and according to the size of the cyst it has dissected off or displaced the pelvic peritoneum. Of course it is well known that the peritoneum is capable of enormous stretching, especially if that stretching be done gradually.

In this case, Mr. Tait, just before closing the abdomen, took two

tablespoonfuls of tr. iodine and added some two ounces of water to it. He then dipped a sponge in the iodine water and pushed it into the cyst and poured in the remainder of the iodine water. He again thoroughly irrigated the cyst with water and closed the abdomen but did not drain. Though the girl was thin, weak and sickly, she rallied well. Some five days after the sac began to suppurate, and he washed it out at intervals with iodine water. He also employed some days after the operation his circular drainage. This was done by passing a rubber drain tube in at the abdominal wound and through Douglas' pouch and vaginal wall, so that material would drain out of both ends of the tube. The girl made a good recovery in some 6 weeks. She gained very much in color and weight, and went home happy.

A second case is that of a little girl, *æt.* 9. It appears to me exactly like the first case, so that no detailed description will be required. Four weeks before the operation she was supposed to have gastritis. The belly swelled and the temperature kept up to 102° , and the pulse ran high. She became very anæmic. Mr. Tait was called to operate as a last chance. He cut down on the swollen abdomen and found the same peculiar relations as in case one. He said it was a urachal cyst, and cut into it. A thick yellow pus rolled out with the usual flocculent shreds of lymph and the gelatinous masses. He thoroughly irrigated the cyst and closed the abdomen, using a rubber drain tube. At present writing, almost 4 months after, she is quite well. The whole relations and conditions, so far as I could see, were precisely similar to the first case. It was impossible to remove the sac, and it dipped into the pelvis to its floor. It looked like a tubercular process.

A third case was that of a woman, *æt.* about 40. She had borne children. Her abdomen was large, brawny, elastic and tense. No wave of fluctuation could be demonstrated, and the diagnosis was very obscure. She was quite ill and had been for some time. Mr. Tait cut into the abdomen but could find no peritoneum. The same peculiar thickened tissue appeared, which was quite vascular. It looked like an old inflamed condition. He at once recognized it as a urachal cyst. It was incised and found full of a kind of semi solid mass. It was pul-taceous and cheesy. Large amounts of flocculent shreds of lymph were present, with jelly-like substances. The finger introduced swept around in a large cavity, whose walls filled the abdomen from umbilicus to pelvic floor. The pathological process in the cyst was tubercular. The peritoneal cavity was never opened, as it was not in case I and II. The cyst was extra-peritoneal to that cavity which contained intestines. The cyst wall was friable, cheesy. One could break

up the wall between the finger and thumb. The tube on the right was so cheesy and rotten that, in removing, it simply tore away, and a ligature cut through it like it would through a ripe banana. So that no ligature was placed on the removed tube, and what little bleeding occurred Mr. Tait stopped by his unique sponge packing. He requested his assistant, Dr. Martin, to wash the abdomen out daily with iodine water. No circular drainage—simply a glass drain tube. I watched the recovery of this woman with surprise, as it did seem impossible that she would get better under such wide-spread pathology. She had some fever and rapid pulse for a week, but did remarkably well.

A fourth case is that of a girl, *æt.* 17. She was very spare, anæmic, and looked generally ill. She never menstruated. She began to be ill 6 months before the operation, and has been mainly in bed since. She simply says she feels bad. As is the rule with every one of the cases, but one, which I have seen, she was decidedly tubercular. The diagnosis before operation was urachal cyst. Mr. Tait cut down into the abdomen, and he came on the peculiar relations of the cyst wall to the belly wall, and at once said: "The diagnosis is confirmed; it is a urachal cyst." The cyst was filled with cheesy matter, which was no doubt tubercular. Mr. Tait carefully examined the interior of the cyst and pronounced it a hopeless case. He closed the abdomen and drained with a rubber drain tube. She recovered well from the operation, and I saw her continually for about a month after the operation and she was then wasting away. The tubercular process was simply following its course to its inevitably fatal end. The relations existed here as in other cases where the cyst dips into the pelvis.

A fifth case was one in the hands of a colleague. It was a boy, *æt.* 12. He had enlargement of the abdomen for months, and it was diagnosed as chronic peritonitis. The characteristic tense, brawny and elastic belly was present. It was clearly a pelvic cyst, encroaching up in the abdomen to a point just above the umbilicus. The wave of fluctuation existed, but not at all marked. A man who had had a few of the urachal cysts would have suspected it. It must not be supposed for a moment that the case was not in talented hands. A most excellent surgeon, with three or four surgeons of experience and ability stood by. The surgeon cut into the abdomen by median incision. He was absolutely puzzled when he came where the peritoneum should be, for he could not find it. He worked about a quarter of an hour on this peculiar appearing tissue, so characteristic of urachal cysts which dip into the pelvis. He finally decided to open the cyst. On cutting through the quarter inch thick walls, pus, cheesy and

pultaceous matter, with flocculent shreds of lymph, came out, but not in such large quantities as such cysts generally contain. The surgeon introduced his finger, and was as much bewildered as he was on finding the cyst. He said the intestines were pushed away up in the belly, and lay on a shelf. His view was that the boy had suffered from appendicitis, and that it was a case of "encysted peritonitis." I know that it was a typical case of urachal cyst which dipped into the pelvis, and so suggested this idea, but the surgeon would not entertain it, as he had had no experience in such cysts. Another medical man present who had seen a dilated urachal cyst said it was just like the one he had seen. The cyst reached from above the umbilicus down to the floor of the pelvis and was open, and the finger swept easily through its large cavity. No intestines except the descending colon came below the umbilicus. A very distinct diaphragm existed just above the umbilicus, on which rested the whole intestines. The surgeon closed the abdomen with silk and a glass drain tube. He did not recognize the character of the cyst, even after the few minutes' discussion occurring at the operation.

I did not hear how the boy went on in the subsequent weeks, but understood he gradually recovered.

A sixth case was that of a boy, *æt.* about 10. The specimen, which was obtained at the autopsy, was exactly the shape of a funnel, with its big end joined at the fundus of the bladder.

It is represented in the diagram No. I.

CONCLUSIONS.

1. The *ætiology* of urachal cysts lies in arrest of development, but in post-natal life they are mainly associated with tuberculosis.

2. We have clinically two kinds of urachal cysts.

3. One kind can be extirpated from the viscera in the abdominal cavity.

4. The other kind dips into the pelvis, and the cyst wall cannot be extirpated from its bed.

5. These cysts may be simply degrees of development or similar pathological processes of the urachus, the size of the cyst being an indication of the extent of the pathology.

6. Mr. Tait claims that the cysts which go down into the pelvis are developed from the allantois, and act as peritoneum

for the pelvic viscera; in fact is peritoneum. No other peritoneum ever entered the pelvis.

7. In those cases where the urachal cyst does not dip into the pelvis, its walls are tough and resemble the urachal wall.

8. In those cases in which the cyst dips into the pelvis, its wall is friable, brittle and gelatinous. It may be as thick as sole leather, and looks quite different from the small abdominal urachal cyst wall.

9. A view may be held which declares that the pelvic peritoneum is simply gradually displaced from the pelvis by the dilating cysts. For those cases which have borne children it may be claimed that sufficient peritoneum has been retained in the pelvis to preserve the functions of the ovaries and tubes.

10. The urachal cyst may lie dormant for indefinite periods, though at any time be excited into activity, resulting in distention.

11. The treatment consists in extirpating the cyst when possible. If in those cases where the cyst dips into the pelvis, and it be impossible to extirpate the cyst from its bed, circular drainage should be employed. The cyst should be washed out at first daily, and later, as required.

12. The mortality in operations for urachal cysts is, so far, about 40%.

13. Dilatation of the urachus is an analogous process to the dilatation of other functionless ducts. Dilatations in Gartner's duct in man and mammals is a good example. It is similar to parovarian cysts which are dilatations of the meso-nephritic tubules, or the tubes of the Wolfian body. Branchial fistula is also a remnant of what evolution has taught man's post-natal life to cast off. The functionless duct known as the vermiform appendix which, from an evolutionary point, is fast fading out of existence, is a splendid sample to tell the tales of our ancestors. Evolution, in accomplishing its process, is ever beset with dangers. For the very structures which it is attempting to stamp out of existence arise to execute destruction. Encysted hydrocele is an example of a dilated functionless duct. Dilatations of the epididymus of the male are analogues of parovarian cysts—both arising from meso-nephritic tubules of the Wolfian body.

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